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Report on the individual review of the annual submission of Finland submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Finland, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 1 to 6 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Ingrid Person Rocha e Pinho (Brazil) and Ms. Daniela Romano (Italy); energy – Ms. Ana Carolina Avzaradel (Brazil), Mr. Alexey Cherednichenko (Kazakhstan) and Mr. Lawrence Kotoe (Ghana); industrial processes and solvent and other product use – Ms. Siriluk Chiarakorn (Thailand) and Ms. Natalya Parasyuk (Ukraine); agriculture – Mr. Jonas Bergström (Sweden) and Mr. Donald Kamdonyo (Malawi); land use, land-use change and forestry (LULUCF) – Ms. Shari Hayne (Canada), Mr. Doru Leonard Irimie (Romania) and Ms. Marina Vitullo (Italy); and waste – Ms. Medea Inashvili (Georgia). Ms. Sandra Jones (New Zealand) and Ms. Irina Yesserkepova (Kazakhstan). Ms. Inashvili and Ms. Romano were the lead reviewers. The review was coordinated by Ms. Lisa Hanle (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Finland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified.

3. All recommendations and encouragements included in this report are based on the expert review team's (ERT's) assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties include in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" (hereinafter referred to as the UNFCCC Annex I inventory reporting guidelines) adopted through decision 24/CP.19. Therefore, when preparing the 2015 annual submission, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Finland was carbon dioxide (CO_2), accounting for 83.2 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by nitrous oxide (N_2O) (8.5 per cent) and methane (CH_4) (6.7 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 78.4 per cent of total GHG emissions, followed by the agriculture sector (9.4 per cent), the industrial processes sector (8.7 per cent), the waste sector (3.4 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 60,965.73 Gg CO_2 eq and decreased by 13.3 per cent between the base year[2] and 2012. The ERT concluded that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base-year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

5. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		CO_2	56 644.17	56 644.17	57 896.31	57 993.05	55 066.73	63 488.30	56 403.34	50 733.33	–10.4
		CH_4	6 169.66	6 169.66	5 978.97	4 275.35	4 208.87	4 265.29	4 122.49	4 083.29	–33.8
		N_2O	7 400.10	7 400.10	6 791.87	6 802.28	5 779.47	5 438.40	5 266.31	5 184.83	–29.9
		HFCs	29.33	0.02	29.33	993.19	888.83	1 169.57	1 031.77	925.53	3 055.7
		PFCs	0.14	0.07	0.14	11.23	9.32	0.75	1.38	1.89	1 250.6
		SF_6	71.29	114.94	71.29	51.16	49.82	35.07	35.82	36.85	–48.3
KP-LULUCF	Article 3.3[b]	CO_2				3 306.71	2 937.09	2 690.59	2 565.36	2 300.71	
		CH_4				0.002	0.001	0.001	IE, NA, NE, NO	IE, NA, NE, NO	
		N_2O				44.26	46.45	48.08	49.77	50.75	
	Article 3.4[c]	CO_2	NA			–39 160.89	–50 078.29	–34 429.55	–34 772.70	–36 789.68	NA
		CH_4	NA			1.21	1.08	0.65	1.02	0.42	NA
		N_2O	NA			1 201.99	1 193.61	1 193.88	1 194.84	1 191.06	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, of the Kyoto Protocol only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		Energy	54 494.90	54 494.90	56 049.43	54 739.41	52 685.86	60 467.73	53 306.61	47 814.14	–12.3
		Industrial processes	5 117.48	5 131.74	4 700.75	7 170.36	5 353.63	5 768.04	5 577.00	5 309.95	3.8
		Solvent and other product use	177.93	177.93	142.37	86.21	71.99	73.23	69.57	65.96	–62.9
		Agriculture	6 549.78	6 549.78	5 964.29	5 847.02	5 705.10	5 902.87	5 796.47	5 707.88	–12.9
		Waste	3 974.60	3 974.60	3 911.06	2 283.26	2 186.45	2 185.52	2 111.47	2 067.79	–48.0
		LULUCF	NA	–13 675.06	–12 768.64	–28 964.64	–38 785.29	–24 092.57	–24 114.07	–25 852.59	NA
		Total (with LULUCF)	**NA**	**56 653.90**	**57 999.26**	**41 161.63**	**27 217.75**	**50 304.82**	**42 747.04**	**35 113.14**	**NA**
		Total (without LULUCF)	**70 314.69**	**70 328.96**	**70 767.90**	**70 126.26**	**66 003.04**	**74 397.39**	**66 861.11**	**60 965.73**	**–13.3**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation				–61.98	–73.75	–93.71	–111.96	–134.97	
		Deforestation				3 412.95	3 057.30	2 832.38	2 727.10	2 486.44	
		Total (3.3)				**3 350.97**	**2 983.54**	**2 738.67**	**2 615.13**	**2 351.47**	
	Article 3.4[d]	Forest management				–37 957.69	–48 883.60	–33 235.02	–33 576.83	–35 598.20	
		Cropland management	NA			NA	NA	NA	NA	NA	NA
		Grazing land management	NA			NA	NA	NA	NA	NA	NA
		Revegetation	NA			NA	NA	NA	NA	NA	NA
		Total (3.4)	**NA**			**–37 957.69**	**–48 883.60**	**–33 235.02**	**–33 576.83**	**–35 598.20**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, of the Kyoto Protocol, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 15 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. Finland also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 17 March 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

9. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Overall assessment of the inventory

10. Table 3 contains the ERT's overall assessment of the annual submission of Finland. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none For 1990, the notation key "NO" was used for CH_4 emissions from natural gas distribution. The ERT is of the view that it is unlikely that no emissions have occurred and recommends that the Party address the issues raised in paragraph 19 below and provide any additional information in the NIR to prove that the consistency of the time series and completeness for 1990 are ensured. In case there are minor emissions, in 1990, the ERT recommends that the Party either estimate emissions or report the notation key "NE"

Issue	*Expert review team assessment*	*General findings and recommendations*
		Non-mandatory: N_2O emissions from industrial wastewater and domestic and commercial wastewater (without human sewage)
		The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
Land use, land-use change and forestry[a]	Not complete	Mandatory: carbon stock changes in: living biomass (losses) in wetlands converted to cropland and grassland; all pools except DOM (see "Non-mandatory" below) for grassland and settlements converted to wetlands; living biomass in land converted to settlements (for forest land converted to settlements only the gains are reported as "NE"); all pools in settlements converted to cropland and grassland; and CO_2, CH_4 and N_2O emissions from biomass burning on land converted to all lands, except forest land and wetlands
		The ERT recommends that the Party estimate and report emissions from all mandatory categories
		Non-mandatory: carbon stock changes: in the DOM pool for cropland remaining cropland; the carbon stock changes in DOM in grassland converted to cropland and cropland converted to grassland; living biomass in grassland remaining grassland; soils in wetlands remaining wetlands; DOM and living biomass (losses) in wetlands converted to cropland and grassland; DOM in grassland and settlements converted to wetlands; non-CO_2 emissions from drainage of soils and wetlands in forest soils (mineral soils); and CO_2, CH_4 and N_2O emissions from biomass burning on settlements
		The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent	Please see paragraphs 17, 39 and 64 below for category-specific findings
Time-series consistency	Sufficiently consistent	Potential time-series issues were identified by the ERT in the energy sector. Please see paragraphs 18 and 27 below for category-specific findings

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on QA/QC procedures	Sufficient	Finland has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan. However, the ERT identified some issues which suggest that the tier 1 QC procedures are not always appropriately implemented, especially in the energy, agriculture and LULUCF sectors. Please see paragraphs 17, 38, 41, 42, 46, 49 and 63 and table 6 below for category-specific recommendations
The ERT's findings on transparency	Sufficiently transparent	Please see paragraphs 17, 20, 29, 30, 39, 47, 58, 59, 64 and 65 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, DOM = dead organic matter, ERT = expert review team, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

4. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

11. The NIR described the national system for the preparation of the inventory. As indicated by Finland in its NIR, there were no changes to the inventory planning process. The description of the inventory planning process, as contained in the report of the individual review of the annual submission of Finland submitted in 2013,[3] remains relevant.

Inventory preparation

12. Table 4 contains the ERT's assessment of Finland's inventory preparation process.

Table 4
Assessment of inventory preparation by Finland

Issue	*Expert review team assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend analysis performed, including and excluding LULUCF
Approach followed?	Tier 2	

[3] FCCC/ARR/2013/FIN, paragraphs 10–17.

Issue	*Expert review team assessment*	*ERT findings and recommendations*
Were additional key categories identified using a qualitative approach?	Yes	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	Finland performs a tier 1 uncertainty analysis annually and a tier 2 analysis periodically. Both analyses were undertaken in the 2014 annual submission
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	
Quantitative uncertainty (including LULUCF)	Level = ±33% (tier 1 and tier 2) Trend = −22% to +28% (tier 2) Trend = ±29% (tier 1)	
Quantitative uncertainty (excluding LULUCF)	Level = −5% to +7% (tier 2) Level = ±6% (tier 1) Trend = ±5% (tier 2) Tread = ±8% (tier 1)	

Abbreviations: ERT = expert review team, IPCC good practice guidance = Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry

Inventory management

13. There were no changes to the inventory management process carried out by the Party for the 2014 annual submission, as indicated by the Party in its NIR. The description

of the inventory management process, as contained in the report of the individual review of the annual submission of Finland submitted in 2013,[4] remains relevant.

5. Follow-up to previous reviews

14. Recommendations from previous reviews that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

B. Energy

1. Sector overview

15. The energy sector is the main sector in the GHG inventory of Finland. In 2012, emissions from the energy sector amounted to 47,814.14 Gg CO_2 eq, or 78.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 12.3 per cent. The key drivers for the fall in emissions are the decreases in emissions in the categories other sectors (by approximately 40.2 per cent), mainly from households and services, and manufacturing industries and construction (by 37.3 per cent). Within the sector, 43.3 per cent of the emissions were from energy industries, followed by 26.5 per cent from transport, 17.5 per cent from manufacturing industries and construction and 9.0 per cent from other sectors. Other (fuel combustion) accounted for 3.3 per cent and fugitive emissions from oil and natural gas accounted for 0.4 per cent. Fugitive emissions from solid fuels were reported as "NO" (not occurring).

16. Finland has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculations made by the Party between the 2013 and 2014 annual submissions were in the following categories: energy industries and other (fuel combustion). In the category energy industries, the recalculation of municipal solid waste (MSW)/recovered fuel combustion was made following changes to the CO_2 emission factor (EF) in certain plants (some plants under the European Union Emissions Trading System (EU ETS) must determine plant-specific EFs, while small users are allowed to use country-specific default EFs). In addition, minor recalculations of point source data have also been performed in order to remove inconsistencies in the plant-level time series (i.e. incorrect labelling of fuels and erroneous or missing fuel data have been corrected as well as erroneous formulae and preliminary data). The recalculations were also made following changes in activity data (AD) for the category other (fuel combustion) in relation to updates of total consumption of wood fuels, peat and gasoil. Compared with the 2013 annual submission, the recalculations decreased emissions in the energy sector for 2011 by 78.30 Gg CO_2 eq (0.1 per cent), and decreased total national GHG emissions by 0.1 per cent. The recalculations were adequately explained.

17. Although the Finnish inventory for the energy sector is well elaborated and concise, transparency can still be improved. Some parts of the text presented in the NIR have not been updated from the previous annual submission, which may lead to misinterpretations of the current NIR, such as in page 131, where the recalculations section indicates that no recalculations have been done, although the immediately preceding paragraph indicates that "[a]fter the latest recalculations (see below), the bunker fuel volumes in the GHG inventory deviate slightly from the IEA data…". In another example, the ERT noted that Finland reported AD for oil venting (13,672.12 kt oil refined for 2012 in CRF table 1.B.2), but the corresponding emissions were reported as "NO". In response to a question raised by the ERT during the review, the Party clarified that the AD refer only to oil refining/storage and should not have been reported under oil venting. Finland further explained that the oil

[4] FCCC/ARR/2013/FIN, paragraph 19.

venting emissions were reported together with the flaring emissions and that it checked with the operator and that the information received is that oil venting should not exist and that all process gases during normal function are routed to the refinery's fuel gas system and burned in different process heaters and boilers, and are thus reported as fuel combustion. Finland further explained that other types of oil venting emissions occur, such as venting of oil storage and drainage systems, and are reported as non-methane volatile organic compound (NMVOC) emissions. The ERT recommends that Finland thoroughly review the next annual submission as part of its quality assurance/quality control (QA/QC) processes in order to ensure that parts of the text from the previous annual submission are not incorrectly carried over to the current annual submission. The ERT also recommends that the Party review the reporting in the CRF tables with respect to oil venting to ensure that there is no duplication of information on AD and that an explanation is provided in the documentation box to clarify that NMVOC emissions are related to oil venting. Finally, the ERT recommends that the Party include in the NIR all information provided to the ERT during the review with regard to oil venting and flaring, in order to increase the transparency of the reporting.

18. Time-series consistency is another area of possible improvement for the energy sector of Finland's annual submission. This is particularly important with regard to the CO_2 implied emission factor (IEF) for liquid fuels in petroleum refining and for fugitive CH_4 emissions from natural gas distribution. In the case of petroleum refining, the EFs used in the inventory from 2005 onwards are based on measured values from the EU ETS and, therefore, estimates for recent years are determined to be accurate. The issue of time-series consistency relates to the period prior to 2005. The CO_2 IEF drops by 6.6 per cent from 2004 (74.14 t/TJ) to 2005 (69.22 t/TJ) and continues to decline until 2012 (55.03 t/TJ), when the IEF is 22.5 per cent lower than it was in 1990 (70.99 t/TJ), and the lowest among all reporting Parties for that year. Finland explained that the reason for the inter-annual fluctuation in the IEFs is the annual variation in the share of fuels (mainly refinery gases) and also stated that this issue was raised during previous reviews. The Party initiated research in late 2013 to investigate whether the CO_2 EFs used for major liquid fuels (i.e. motor gasoline, diesel oil, light fuel oil, heavy fuel oil and liquefied petroleum gas (LPG)) and refinery gases for the period prior to 2005 are the most appropriate for the country. First efforts of the research focused on the major liquid fuels, but an initial analysis of refinery gases was also undertaken and the preliminary results of the research were shared with the ERT in response to questions raised during the review. Although a final conclusion has not yet been reached, there is an indication that the fluctuations may be due to changes in refinery processes, such as a shift in the palette of the refineries towards lighter products and the production and use of hydrogen as part of the refinery process, which affect the properties of refinery gases and might explain the declining trend. The final results of the research will be provided in the 2015 annual submission.

19. With regard to natural gas distribution, the CH_4 emissions have not been estimated for 1990. In response to observations made during earlier stages of the review, the Party indicated that it does not expect emissions from natural gas distribution to have occurred because natural gas was only distributed in the newer parts of the pipeline in 1990. Further, in response to an earlier draft of this report, Finland referred to page 65 of the NIR, which states that town gas distributed in 1990 did not include CH_4, thus the fugitive CH_4 emissions were zero. The Party also noted that, according to information received from the distributer, there were no CH_4 emissions from distribution in Finland in 1990. However, the ERT is of the view that it is unlikely that no emissions occurred, and not considering these emissions leads to a time-series consistency issue and a potential lack of completeness for 1990. The ERT further notes that, in its NIR, Finland also suggests that there could be some CH_4 from this gas, indicating on page 124 that this town gas "did not contain substantial amounts of methane". The ERT recommends that the Party address these issues and

provide any additional information in the NIR to prove that consistency of the time series and completeness for 1990 are ensured. If minor emissions, in 1990, cannot be excluded, the ERT recommends that Finland either estimate those emissions or report the notation key "NE" (not estimated).

20. In previous review reports, the ERTs noted that the AD for the energy sector presented in the NIR were aggregated both in terms of categories and fuels. In response to recommendations made in previous review reports, Finland has made improvements in the reporting of disaggregated fuel consumption data in the energy sector. Although the ERT believes that the aggregation of AD does not affect the emission estimates, some further improvement would increase the transparency of emission calculations. Therefore the ERT recommends that Finland make efforts to provide disaggregated AD, to the extent possible, especially for those fuels for which the aggregation would imply the use of very different EFs (e.g. other solid fuels in manufacturing industries and construction, other fuels in energy industries), to improve the transparency of its reporting.

2. Reference and sectoral approaches

21. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 22–26 below.

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross references*
Difference between the reference approach and the sectoral approach	Energy consumption: –47.72 PJ, –7.79% CO_2 emissions: –2,013.84 Gg CO_2, –4.34%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	
Are differences with international statistics adequately explained?	No	22, 23
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	25
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	26

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

22. As shown in table 5 above, the difference in energy consumption between the reference approach and the sectoral approach, in 2012, was –7.8 per cent (–4.3 per cent for CO_2 emissions. According to CRF table 1.A(c), the relatively high difference in liquid fuels is caused by statistical differences in the oil balance. The discrepancy is also addressed in the NIR, where it is stated that there are no obvious reasons for the differences and any final conclusions cannot be made without further, resource demanding, investigations. The

ERT recommends that Finland continue to explore the reasons for the difference between the sectoral and reference approach, especially for those years where the differences are significant, and provide additional explanation in its NIR in order to increase the transparency of its reporting.

23. The difference in apparent consumption between the reference approach and the data reported to the International Energy Agency (IEA) was 1.5 per cent in 2012. However, the growth rate of total apparent consumption in the period 1990–2012 shows a discrepancy between the two sources of data of –14.1 per cent in the CRF tables and –7.1 per cent in the IEA data. In response to observations made during earlier stages of the review, Finland explained that the IEA time series has been updated for the years 2000–2012 by Statistics Finland and that some errors occur in the earlier years of the time series, especially with regard to the oil balance data. The Party has reported in its NIR that a check and review of the official oil balance data for the period 1990–1997 would be needed in order to clarify the differences between the reference approach and the sectoral approach, specifically for the years 1992 and 1993, which would require cooperation between different stakeholders and an update of the IEA time series data. This would also mean that a recalculation of the energy balance for that period would be required, as well as an important investment. In view of the need for improvement in other areas of the inventory, Finland considered that such research was not a priority. The ERT acknowledges that the issue was not a priority in 2014, but recommends that the Party address the errors identified in the early years of the time series in the next annual submission.

International bunker fuels

24. The comparison of the data reported in the CRF tables and the IEA data for international marine bunkers exhibits little variation across the time series, except for the period 2009–2012. Data for residual fuel oil in the CRF tables are between 3.0 per cent higher and 13.2 per cent lower than the IEA data for that period. In response to questions raised by the ERT during the review, Finland explained that discrepancies are due to rounding and the "Aland-correction", which prescribes that all trips going to Sweden through Aland are considered to be international, since the number of passengers or cargo leaving or entering the ships in that port is very low. In 2012, residual fuel oil in marine bunkers reported in the CRF tables is 13.2 per cent lower than in the IEA data, whereas the domestic navigation figures are 3.5 per cent higher in the CRF tables than in the IEA data. Finland reported in its NIR that the calculation of energy quantities has been streamlined to remove intermediate calculations, thereby removing small inconsistencies caused by the rounding of conversion factors. Finland also reported that the data have been checked against the data reported to IEA as part of the "Oil questionnaire" and small differences (less than 0.5 per cent) in physical quantities were detected, probably caused by the different roundings used in the time series.

25. Apart from the issue of fuel allocation between domestic and international navigation described above, total residual fuel oil reported in the CRF tables, taking into account domestic navigation and international marine bunkers, is 6.7 per cent lower than the data reported to IEA for 2012. In response to a question raised by the ERT during the review, Finland provided detailed calculations that explain the difference in total fuel reported in the CRF tables and to IEA, which is mainly due to the fact that the "Aland-correction" is taken into account in domestic navigation only in the IEA data. The ERT is satisfied with the explanation provided and recommends that the Party include this rationale in the NIR.

Feedstocks and non-energy use of fuels

26. In the previous review report, the ERT identified that Finland had not reported additional information on lubricants in CRF table 1.A(d) and noted the need to provide a

more complete explanation of the assumptions and allocation of emissions related to the use of lubricants. In the 2014 annual submission, additional information has been provided on lubricants in CRF table 1.A(d), both with regard to the CO_2 not emitted (26.40 Gg CO_2 eq) and the associated CO_2 emissions (53.40 Gg CO_2 eq). The ERT welcomes this improvement. Finland has reported that specified energy uses of feedstocks and lubricants are subtracted from the corresponding total amounts of feedstocks and lubricants, and that for the remainder of the feedstocks, 100 per cent of carbon is estimated to be stored in products (mainly plastics). For the remainder of the lubricants, 33 per cent of carbon is estimated to be stored in products (recycled lubricants) and 67 per cent of carbon released as CO_2 either in burning of lubricants in motors or in illegal combustion of waste oil in small boilers. These non-specified emissions from burning of feedstocks (which are not included in manufacturing industries and construction) are included in the category other (energy). The ERT commends Finland for implementing the recommendations made in the previous review report, which has improved the transparency of the Party's reporting.

3. Key categories

Stationary combustion: liquid and solid fuels – CO_2

27. In previous review reports, the ERT highlighted the issue of the time-series consistency of the CO_2 IEF for coal used in public electricity and heat production owing to the rapid decrease between 2007 (93.72 t/TJ) and 2008 (92.76 t/TJ) and the possibility of an overestimation of emissions in the preceding years. In response to questions raised during previous reviews, Finland informed the ERT that the applicability of the default EF (94.60 t/TJ) for the years 2004–2007 could be further investigated, but that the Party would not prioritize this matter over more urgent development needs. Finland has reported in its current NIR that in 2014 other needs, such as the implementation of the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), have been prioritized. The ERT accepts Finland's explanation and recommends that the Party take this opportunity, with the implementation of the 2006 IPCC Guidelines, to ensure time-series consistency.

28. For manufacturing of solid fuels and other energy industries, there were significant inter-annual changes in the CO_2 IEF for solid fuels between 1990 (163.21 t/TJ) and 2012 (81.14 t/TJ). In 2012, the value reported was 50.3 per cent lower than in 1990. In response to questions raised by the ERT during the review, Finland explained that the inter-annual variations result from changes in the share of different fuels, such as coke oven gas and blast furnace gases. During the review, Finland shared confidential information with the ERT on the percentage of the solid fuel mix from 1990 to 2012 which confirmed that considerable fluctuations in the fuel mix occurred throughout that period. The ERT is satisfied with the information provided.

Road transportation: liquid fuels – CH_4

29. There are significant inter-annual changes in the CH_4 IEF for liquid fuels in road transportation for several years of the time series. For example, in 2012 the CH_4 IEF reported for gasoline (13.69 kg/TJ) is 11.2 per cent lower than in 2011 (15.42 kg/TJ) and exhibits the second largest decrease among reporting Parties. In response to questions raised during earlier stages of the review, Finland indicated that annual changes in the share of diesel, gasoline, biodiesel and biogasoline could explain the variation in the IEF. Table 3-3-3 of the NIR shows that, from 2011 to 2012, there has been a decrease in the consumption of gasoline, diesel oil and natural gas, whereas an increase in liquid and gaseous biofuels is observed. For the same period, table 3-3-5 of the NIR shows an increase of bio-components of liquid fuels for gasoline, diesel oil and biogas. The Party also clarified that the transport calculation system is under review for the next annual

submission. In response to a further question raised by the ERT during the review, Finland also explained that the model for road transport emissions will be totally revised, especially with regard to the distances travelled (in kilometres) associated with different types of vehicles and fuels. Changes in fuel totals should be very small. The ERT recommends that the Party include all relevant information with regard to the calculation of CH_4 emissions in the submission, including the results of the improved model and its impact on the CH_4 IEF, in order to improve transparency.

4. Non-key categories

Stationary combustion: natural gas, biomass and other fuels – CH_4

30. The ERT noted that the CH_4 IEF for several industries has exhibited an unusual trend. For pulp, paper and print, for example, the CH_4 IEF for biomass (ranging from 1.30 kg/TJ to 1.44 kg/TJ) is the lowest of reporting Parties (ranging from 1.30 to 284.12 kg/TJ) and lower than the IPCC default value (30 kg/TJ). In response to questions raised by the ERT during the review, Finland explained that the non-CO_2 EFs used are based on studies which include plant-level measurements made in selected plant types. The Party has reported in its NIR that the CH_4 EFs were originally taken from a research study conducted in 1992 and 1994 and updated by studies conducted in 2005 and 2006. The Party has expanded the database to include a more detailed classification of boilers and expert judgement has been applied when data for new boilers were not available. Measurements were also made in several power plants in Finland in 2005. Similar trends have been observed for food processing, beverages and tobacco for other fuels, as well as for the category other (manufacturing industries and construction) for gaseous fuels. In both cases, the Party explained that annual changes in individual boiler data are responsible for the trend observed in the CH_4 IEFs. In response to a question raised by the ERT during the review, Finland confirmed that, in the case of food processing, beverages and tobacco, plants have different CH_4 EFs. The Party indicated that any changes in individual plant boiler data would impact the IEFs and that it is not possible to report every change or correction in the plant-level data in the NIR for practical reasons and to maintain confidentiality, but that further information may be provided upon request. The ERT recommends that the Party include a paragraph about the changes in boiler data and the impact of these changes on the CH_4 IEFs in the NIR and update the text annually in order to improve transparency.

Oil and natural gas: liquid and gaseous fuels – CO_2 and CH_4

31. Finland has reported in its NIR that fugitive emissions have decreased by 25.5 per cent since 1990 owing to changes in oil refining processes, especially in flaring (NIR page 65). However, in CRF table 1.B.2 a comparison of the values for 1990 (9,884.00 kt) and 2012 (13,672.12 kt) shows that the amount of oil refined/stored rose by 38.3 per cent (CO_2 and CH_4 emissions rose by 37.5 per cent and 38.3 per cent, respectively). CO_2 emissions from oil flaring decreased by 17.6 per cent in the period 1990–2012 (from 121.93 Gg in 1990 to 100.48 Gg in 2012), in spite of a 35.9 per cent increase in the AD (from 1,131.60 kt in 1990 to 1,537.75 kt in 2012), and a 39.4 per cent reduction was observed in the CO_2 IEF between 1990 (107,753.12 kg CO_2/kt) and 2012 (65,345.46 kg CO_2/kt). In response to a question raised by the ERT during the review regarding the reason for the decrease in emissions from oil flaring, given that the AD showed an increase in the amount flared, Finland explained that some plants have reported both CO_2 emissions and flared gas, whereas other plants have reported oil flaring including CO_2 emissions only (but not AD), which cannot be inferred solely from the IEF. Finland informed the ERT that it will try to obtain specific data from the plant operators for the next annual submission in order to disaggregate the contribution of CO_2 emissions in the CO_2 IEF and isolate it from other

interferences. The ERT recommends that Finland include all relevant information provided during the review in the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

32. In 2012, emissions from the industrial processes sector amounted to 5,309.95 Gg CO_2 eq, or 8.7 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 65.96 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since 1990, emissions have increased by 3.8 per cent in the industrial processes sector, and decreased by 62.9 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are the increases in the production of steel and hydrogen, consumption of halocarbons and use of limestone and dolomite. Within the industrial processes sector, 43.1 per cent of the emissions were from metal production, followed by 21.9 per cent from mineral products, 18.2 per cent from consumption of halocarbons and SF_6 and 16.8 per cent from chemical industry. Emissions from other production were reported as "NO" and emissions from other (industrial processes) were reported as "NA" (not applicable).

33. Finland has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. The most significant recalculations made by Finland between the 2013 and 2014 annual submissions were in the following category: metal production. The recalculations were made following changes in AD. The AD for one limestone-using plant were included and emissions in the iron and steel industry were corrected for the entire time series. Also, the AD for one hydrogen production plant were corrected for the years 2010–2012. HFC emissions from foam blowing were recalculated for 2010 and 2011 due to the inclusion of HFC-152a emissions from the manufacturing of extruded polystyrene. Compared with the 2013 annual submission, the recalculations decreased emissions in the industrial processes sector by 8.86 Gg CO_2 eq (0.2 per cent), and decreased total national GHG emissions by 0.01 per cent. The recalculations were adequately explained in the NIR.

2. Key categories

Consumption of halocarbons and SF_6 – HFCs and PFCs[5]

34. The ERT notes that the Party continues to report emissions only from stocks in CRF table 2(II).F for the subcategories occurring in Finland. The AD, as well as the emissions from manufacturing and disposal, are reported as "NA", "NO" or "C" (confidential). In the previous review report, the ERT encouraged Finland to explore how to provide as much information on AD and emissions as possible in CRF table 2(II).F. The ERT acknowledges Finland's assessment in the NIR that companies generally do not have data at the necessary level of aggregation as required by the CRF tables. The ERT also acknowledges Finland's planned improvements for this category, namely to review the reporting in the context of the 2006 IPCC Guidelines, and encourages the Party to consider further opportunities to report underlying AD and emissions information to the extent possible in order to improve transparency.

Other (solvent and other product use) – CO_2

35. In the previous review report, the ERT recommended that Finland develop a way of calculating and reporting indirect CO_2 emissions from other activities (fat, edible and non-

[5] PFC emissions from this category are not key. However, since all emissions related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

edible oil extraction) under other (solvent and other product use). Finland assumed that all NMVOC emissions were of fossil origin, even though some are biogenic, thereby overestimating emissions. The previous ERT recommended that the Party develop a method which would allow CO_2 emissions from biomass to be distinguished from those from the fossil component, report only the fossil component in the CRF tables of the annual submission, and provide an appropriate methodology and process description in the NIR. In response to the recommendation made in the previous review report, Finland indicated that it considers that is not possible to develop a system which would distinguish between the CO_2 emissions of the fossil and biological components, as such assessment would have to be done on a case-by-case basis. The ERT accepts that it is not a priority to carry out further studies for this category, but encourages the Party to consider conducting research for a future annual submission.

D. Agriculture

1. Sector overview

36. In 2012, emissions from the agriculture sector amounted to 5,707.88 Gg CO_2 eq, or 9.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 12.9 per cent. The key drivers for the fall in emissions are the reduction in the cattle population and the reduced use of mineral fertilizers. Within the sector, 61.3 per cent of the emissions were from agricultural soils, followed by 27.1 per cent from enteric fermentation, 11.7 per cent from manure management and 0.01 per cent from field burning of agricultural residues. Emissions from rice cultivation, prescribed burning of savannas and other (agriculture) were reported as "NO".

37. Finland has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made between the 2013 and 2014 annual submissions were in the following categories: CH_4 emissions from manure management from poultry and CH_4 emissions from enteric fermentation from cattle. The recalculations were made in order to rectify identified errors and following changes in AD, respectively. Compared with the 2013 annual submission, the recalculations decreased emissions in the agriculture sector for 2011 by 84.64 Gg CO_2 eq (1.4 per cent), and decreased total national GHG emissions by 0.1 per cent. One of the recalculations, for emissions from enteric fermentation from swine, was not adequately explained (see para. 39 below).

38. The ERT identified some cases of errors and inconsistencies in the NIR. For example, there were errors in NIR tables 6.3-3 and 6.4-7 (where data on the area of cultivated organic soils for the latest inventory year incorrectly copied the data for the year 1990 and did not match the CRF tables). In response to questions raised by the ERT during the review, the Party stated that the correct values have been used in the calculations and are reported in the CRF tables but errors arose when transferring the data to the NIR. Further, the ERT noted that appendix 6a of the NIR, entitled "The equations used in the calculation of greenhouse gas emissions from the agriculture sector", was not updated to reflect the recalculations undertaken for this sector, and incorrect information was found in NIR table 10.4-2 regarding the Party's response to previous reviews. The ERT recommends that the Party enhance its QC procedures to ensure that the NIR is updated with the correct data and information for every new annual submission.

2. Key categories

Enteric fermentation – CH_4

39. In response to recommendations made in the previous review report that Finland review the livestock characterization data and ensure consistency between the nitrogen (N) excretion model and the enteric fermentation model used, the Party has made recalculations for CH_4 emissions from enteric fermentation for cattle and swine. For cattle, the daily weight gains have been updated to ensure the consistency of data inputs and assumptions between manure management and enteric fermentation. Concerning swine, the Party now estimates the emissions based on an enhanced characterization of different swine categories. The ERT commends the Party for these efforts. However, the description in the NIR of how the country-specific EFs for the different swine categories were developed was not transparent, the values for mature weight for heifers and calves were missing in NIR table 6.2-5, and the formula to calculate the average weight gain in appendix 6a to the NIR was not updated. In response to questions raised by the ERT during the review, the Party provided additional information on the underlying data supporting the development of the country-specific EFs for swine. The ERT recommends that the Party include a description in the NIR of how the EFs for the different swine categories were compiled, complete NIR table 6.2-5 and update appendix 6a of the NIR in order to improve transparency.

Manure management – N_2O

40. In the previous review report, the ERT recommended that Finland provide a reference to the ratio used to divide N between the dung part and urine part of the manure for the calculation of the weighted N_2O EF for solid storage. A reference to this parameter has still not been provided in the NIR of the 2014 annual submission. In NIR table 10.4-2, Finland states that "[t]he description will be further improved for the next submission. The reference is still missing but the N allocation is based on analysis of N content in slurries, dung and urine". The ERT reiterates the recommendation made in the previous review report that Finland include this reference in the NIR.

Direct soil emissions – N_2O

41. In the previous review report, the ERT noted that Finland changed its reporting of the fraction of crop biomass that is N ($Frac_{NCRBF}$) from a value in the 2012 annual submission (0.04 in 2010) to the notation key "NA" in the 2013 annual submission. In response to questions raised during the previous review, Finland had indicated that reporting a value for $Frac_{NCRBF}$ would not accurately reflect the calculations, and therefore the Party reported it as "NA". The previous ERT recommended that Finland continue to report this fraction in the CRF tables in the form of a weighted average. In its 2014 annual submission, Finland indicates in NIR table 10.4-2 that these values are now reported in the NIR, table 6.5-2. However, this fraction is not reported in NIR table 6.5-2, nor is it reported in the CRF tables. The ERT notes that Finland's decision not to report $Frac_{NCRBF}$ does not impact the emission calculations, and therefore the ERT finds Finland's approach acceptable for the current annual submission. Nevertheless, the ERT recommends that the Party improve its QC procedures to ensure that the correct information is provided in NIR table 10.4-2.

42. The previous ERT noted that the total of all crops listed for 1990 (adding all crops together) was 20.0 per cent greater than the average for the rest of the reporting period, between 1991 and 2011. In response to questions raised during the previous review, Finland had responded that agricultural production changed considerably in the beginning of the 1990s. Many farms ceased operating and the area of fallow more than doubled between 1990 and 1991. The recommendation in the previous review report was that Finland include the explanation for the sudden decrease in total crop yield after 1990 in its annual submission. The current ERT notes that Finland has reported in table 10.4-2 of the

NIR that in section 6.1.1, "[m]ore text on the trend variations was added". However, section 6.1.1 contains no significant changes on this topic between the 2013 and the 2014 annual submissions. The ERT reiterates the recommendation made in the previous review report that Finland provide this explanation in the NIR, and further recommends that the Party improve its QC procedures to ensure that the correct information is provided in NIR table 10.4-2.

3. Non-key categories

Manure management – CH_4

43. Finland uses a country-specific methane conversion factor (MCF) of 10 per cent for deep litter, referring to a paper by Dustan (2002).[6] The ERT was of the view that this reference alone does not provide sufficient support for the use of the MCF for deep litter, as opposed to the value provided in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) of 39.0 per cent for cool climates. The ERT notes that the IPCC reference states that although the current default value of 39.0 per cent may be too high, an alternative value is not specifically provided. In response to further questions raised by the ERT during the review, Finland noted that in addition to Dustan and the 2006 IPCC Guidelines, which indicate that the current IPCC default value is too high, the IPCC good practice guidance comments that the MCFs for deep litter are similar to those for liquid/slurry (IPCC good practice guidance, page 4.37). For example, the MCF for liquid manure and deep litter are exactly the same for all climates in both the IPCC good practice guidance and the 2006 IPCC Guidelines. This, in combination with the paper by Dustan which justifies the use of an MCF of 10 per cent for storage of liquid manure in countries with a climate such as Finland's, as well as the ERT's knowledge of recent scientific literature indicating that the IPCC default EF for deep litter may be too high, lead the ERT to accept Finland's use of the same MCF for liquid manure and deep litter. However, the ERT recommends that Finland improve the justification of the use of the country-specific MCF for deep litter in the annual submission.

E. Land use, land-use change and forestry

1. Sector overview

44. In 2012, net removals from the LULUCF sector amounted to 25,852.59 Gg CO_2 eq. Since 1990, net removals have increased by 89.0 per cent. The key driver for the rise in removals is the increment in the carbon stock in living biomass in forest land remaining forest land. Within the sector, 37,223.52 Gg CO_2 eq of net removals were from forest land. Net emissions were reported from cropland (6,935.85 Gg CO_2 eq) and from wetlands (1,909.58 Gg CO_2 eq). Other (LULUCF) accounted for net emissions of 1,287.46 Gg CO_2 eq and settlements accounted for 906.40 Gg CO_2 eq. The remaining 331.64 Gg CO_2 eq were from grassland.

45. Finland has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Finland between the 2013 and 2014 annual submissions were in the following categories: forest land and settlements. The recalculation for forest land and settlements were made primarily following changes in AD (the time series of land-use areas was recalculated). Compared with the 2013 annual

[6] Dustan A. 2002. *Review of Methane and Nitrous Oxide Emission Factors for Manure Management in Cold Climates*. JTI-rapport 299, ISSN 1401-4963. Available at <http://www.jti.se/uploads/jti/r299ad.pdf>.

submission, the recalculations increased emissions in the LULUCF sector by 463.37 Gg CO_2 eq (1.9 per cent). The recalculations were adequately explained.

46. The ERT noted some discrepancies between the CRF tables and the NIR data. The ERT noted that, for example, the areas of land converted to grassland in CRF table 5.C, both for organic and mineral soils (21.56 kha and 62.51 kha, respectively, for 2012), are different from those reported in the NIR (approximately 20 kha and 60 kha, respectively, for 2012). In response to a question raised by the ERT during the review, Finland explained that the discrepancies are due to errors affecting the NIR, resulting in the inclusion in the NIR tables of the areas related only to southern Finland. The ERT recommends that Finland ensure the consistency of the reported data by enhancing the QA/QC procedures.

47. Finland assesses the land-use categories and land-use changes on the basis of the National Forest Inventory (NFI); for the period 2007–2012, land-use information on the NFI sample plots has been updated with orthophoto interpretation. In response to a question raised by the ERT during the review regarding land representation, Finland provided additional information on the total forest area assessed by the NFI and on the use of ancillary data sources to detect the land-use changes occurring before and after the NFI measurements. The ERT recommends that Finland increase the transparency of the NIR by including this information in the annual submission.

2. Key categories

Grassland remaining grassland – CO_2

48. Finland has reported the carbon stock changes in living biomass as "NE" in CRF table 5.C. The ERT considers that this reporting is not in accordance with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). In response to a question raised by the ERT during the review, Finland explained that the pool will be reported in the next annual submission, on the basis of a currently ongoing study. The ERT reiterates the recommendation made in the previous review report that Finland report the carbon stock changes associated with the living biomass pool in its annual submission.

3. Non-key categories

N_2O emissions from disturbance associated with land-use conversion to cropland – N_2O

49. The ERT noted that the area of land converted to cropland reported in CRF table 5(III) (114.94 kha) is different from the area reported in CRF table 5.B (115.97 kha). In response to a question raised by the ERT during the review, Finland informed the ERT that an error had occurred in CRF table 5(III), and further explained that the error affected the AD only. The ERT recommends that Finland accurately report these figures in its annual submission and enhance its QA/QC procedures.

Biomass burning – CO_2, CH_4 and N_2O

50. Finland has reported biomass burning in land converted to cropland, grassland remaining grassland (wildfires only), land converted to grassland, and settlements as "NE" for the entire time series. In response to an earlier draft of this report, Finland stated that according to fire statistics, there were no fires on croplands or grasslands between 1995 and 2012. There are no data available on fires on croplands or grasslands for earlier years, or on settlements for the entire time series and the Party also stated that there probably would be no additional data for the 2015 annual submission. The ERT considers that this reporting is not in accordance with the IPCC good practice guidance for LULUCF. The ERT recommends that Finland report emissions related to biomass burning from the above-mentioned categories in its annual submission.

F. Waste

1. Sector overview

51. In 2012, emissions from the waste sector amounted to 2,067.79 Gg CO_2 eq, or 3.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 48.0 per cent. The key drivers for the fall in CH_4 emissions are the implementation of the new Waste Act (1994) and the European Union (EU) landfill directive (1999/31/EC) regarding the minimization of waste generation, as well as increases in waste recycling, landfill gas recovery and implementation of N purification technology. In addition, since 2008, GHG emissions from landfills have decreased as a result of increased waste incineration as opposed to disposal of waste to landfills. The increase in the waste sector emissions in 2006 was associated with temporary technical problems in one landfill gas recovery plant. The key drivers for the reduction in CH_4 emissions from wastewater handling (28.2 per cent since 1990) are the decrease in uncollected wastewater and N purification of collected wastewater. Conversely, GHG emissions from composting doubled during the reported period because of several successively introduced State and EU regulations since 1989. Within the sector, 84.0 per cent of the emissions were from solid waste disposal on land, followed by 10.3 per cent from wastewater handling and 5.7 per cent from other (waste). Emissions from waste incineration are reported as "IE" (included elsewhere) as they are reported in the energy sector.

52. Finland has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Finland between the 2013 and 2014 annual submissions were in the following subcategories: N_2O emissions from uncollected domestic wastewater handling and CH_4 emissions from uncollected domestic wastewater handling. The recalculations were made following the correction of AD on protein consumption and population and the correction of population data, respectively. Compared with the 2013 annual submission, the recalculations decreased emissions in the waste sector for 2011 by 0.26 Gg CO_2 eq (0.01 per cent) and had a negligible impact on total national GHG emissions. The recalculations were adequately explained.

53. The Party illustrates the process of waste handling throughout Finland in figure 8.1-3 of the NIR without any explanations in the text. In response to questions raised by the ERT during the review, the Party explained that this figure has been included in the NIR in response to recommendations made in previous review reports only to illustrate where all emissions related to waste management are reported in the GHG inventory for users who are not familiar with the UNFCCC/IPCC classification system. The Party noted that similar figures are included for other sectors. The ERT requested clarification on the inclusion of emissions from "road transport (waste collection and transportation)" in the figure. In response to questions raised by the ERT during the review, Finland indicated that all energy-related emissions are, as a rule, included in the energy sector. The emissions from solid waste collection and transportation referenced in figure 8.1-3 of the NIR refer mainly to diesel oil used for waste management purposes. The ERT commends Finland for including this additional information in the NIR and for improving transparency.

54. The ERT welcomes the improvement in transparency between the 2013 and 2014 annual submissions for the entire sector, but particularly for CO_2 emissions from waste incineration and N_2O emissions from domestic and commercial wastewater handling.

55. The ERT welcomes Finland's plans for category-specific improvements for solid waste disposal on land to examine data on the domestic consumption of paper and board and to obtain new information on the composition of mixed construction and demolition waste.

2. Key categories

Solid waste disposal on land – CH_4

56. Finland uses a tier 2 first-order decay (FOD) method to estimate CH_4 emissions, which is in line with the IPCC good practice guidance for key categories. The AD used in the model include national data (e.g. total amount of waste, by type, taken to landfills from 1997 onwards) on each landfill from Finland's national data collection system (VAHTI), except for the Åland region which is estimated based on population. The AD (i.e. waste type) are classified according to the European Waste Catalogue classification system and the EFs are mostly default values from the 2006 IPCC Guidelines, with additional factors provided by expert judgement and some national-level studies. The ERT finds that values from the 2006 IPCC Guidelines complemented by expert judgement, national research and measurements have been determined and documented by Finland to best represent the national circumstances.

57. The morphological composition of MSW was estimated based on generated MSW. Data on landfill gas recovery are based on actual information taken from the Finnish Biogas Plant Register. The values of degradable organic carbon (DOC) degraded are determined based on the weighted average fraction of DOC dissimilated based on waste mix types landfilled and the IPCC default values. The ERT concludes that Finland's reporting of this category is consistent with the IPCC good practice guidance as the Party uses the FOD model.

Wastewater handling – N_2O

58. The Party reported N_2O emissions from human sewage as 0.25 Gg of N_2O instead of 0.53 Gg (which would be the value for emissions estimated using the default EF of 0.01 kg provided in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). In response to a question raised by the ERT during the review, the Party explained that the lower emissions are a result of the purification technology Finland uses for human sewage wastewater. The Party responded that the N_2O emissions consist of collected and uncollected wastewater. The default protein values are used only for uncollected wastewater. The measured N values are used for collected wastewater which leads to lower human sewage emissions. The EF of 0.01 kg of N_2O-N/kg sewage-N produced for the wastewater before purification is constant throughout the time series and for collected and uncollected wastewater. The IEF reported in CRF table 6.B (0.005 kg of N_2O-N/kg sewage-N) is different because the N load per person from collected wastewater is smaller owing to purification than the N load per person from uncollected wastewater (which is calculated according to protein consumption and population). The N purification (nitrification and denitrification) reduces the N load to the waterways, which equates to lower emissions. The ERT recommends that the Party improve the transparency of its reporting by including a clear description of the methodology used for the purification of sewage wastewater in its NIR.

Other (waste) – CH_4 and N_2O

59. CH_4 emissions from composting steadily increased from 1.03 Gg in 1990 to 3.27 Gg in 2007, then slightly decreased to 2.78 Gg in 2012. While noting that it is not mandatory to report CH_4 and N_2O emissions from other (waste), the ERT reiterates the recommendation made in the previous review report that Finland improve the transparency of the composting category by enhancing the descriptions in the NIR on the AD for composted waste and the destination of industrial waste and sludge from wastewater handling plants.

3. Non-key categories

Waste incineration – CH_4 and N_2O

60. Finland reports CH_4 and N_2O emissions from waste incineration as "IE" and includes them in the energy sector as "other fuels" in CRF table 1.A. However, the Party does not provide any information about the treatment of clinical waste. The ERT encourages Finland to provide information on clinical waste management practices and regulations, in order to improve the transparency of the inventory submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

61. Table 6 provides an overview of the information reported and parameters selected by Finland under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of Finland's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Forest management Years reported: 2008, 2009, 2010, 2011, 2012	The ERT recommends that Finland ensure consistency between the KP-LULUCF CRF tables and the NIR data, by enhancing the QA/QC procedures (see para. 63 below)
Period of accounting		Commitment period accounting
Finland's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

Abbreviations: CRF = common reporting format, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NIR = national inventory report, QA/QC = quality assurance/quality control.

62. Chapter G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities and the change from the first commitment period to the second commitment period, paragraphs 63–66 below contain the ERT's assessment of the Party's adherence to the current reporting

guidelines and do not provide specific recommendations for reporting these activities in the 2015 annual submission.

63. The ERT noted some discrepancies between the KP-LULUCF CRF tables and the NIR data. The ERT noted, for example, inconsistencies between NIR tables ES.4-1 and 2.5-2 and KP-LULUCF CRF table 5(KP-I)B.1 (which report net CO_2 removals from forest management as 36,788 Gg and 36,790.69 Gg, respectively). In response to a question raised by the ERT during the review, Finland explained that the discrepancies are due to errors affecting the NIR and the Party provided additional information to better explain the data reported. The ERT recommends that Finland ensure the consistency of the reported data, by enhancing the QA/QC procedures. The ERT also encourages Finland to increase the transparency of the NIR by including the information provided to the ERT during the review in its NIR.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

64. The ERT noted a large recalculation for afforestation and reforestation when comparing the 2014 and 2013 annual submissions (an average increase in removals of approximately 146 per cent). In response to a question raised by the ERT during the review, Finland explained that the recalculation was due to the update of biomass values used in the estimation of the carbon stock changes. Finland stated that the new NFI11 data (covering the period 2009–2012) were used because they more accurately represent the first commitment period than the previous NFI10 data (covering the period 2005–2008), and provided additional information to explain the changes that had occurred. The ERT recommends that Finland increase the transparency of the NIR by including information on recalculations in its annual submission.

Deforestation – CO_2

65. Finland reported emissions from the conversion of forest land to wetlands (peat lands) for the litter pool as "IE". In response to a question raised by the ERT during the review, Finland explained that the decomposition of litter is included in the emissions from stock piles (the EFs for peat extraction include emissions from production fields, stock piles and ditches). The emissions due to decomposition of fine dead roots (litter in peat) are included in the EFs for peat production fields. The ERT accepts the explanation provided by Finland, but recommends that the Party increase the transparency of the NIR by including this information in its annual submission.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – N_2O

66. Finland reported N_2O emissions from mineral soils under forest management as "NE" in table 5(KP-II)2. In response to a question raised by the ERT during the review, Finland explained that the IPCC good practice guidance for LULUCF provides methods for this category in the appendix, and, therefore, the estimation of these emissions is not mandatory. Finland also provided additional information on recent research related to this issue.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

67. Finland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the standard independent assessment report (SIAR) on the SEF

tables and the SEF comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

68. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

69. Finland has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

70. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

Table 7

Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–476 368		–476 368
Harvested land	NA		NA
Deforestation	14 516 159		14 516 159
Forest management	–16 973 124		–16 973 124
Article 3.3 offset[c]	–14 039 791		–14 039 791
Forest management cap[d]	–2 933 333		–2 933 333
Cropland management	NA		NA
Grazing land management	NA		NA
Revegetation	NA		NA

Abbreviations: CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[7] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

71. Based on the information provided in table 7 for the activity afforestation and reforestation, Finland shall: for non-harvested land, issue 476,368 removal units (RMUs) in its national registry. Neither issuance nor cancellation is required for harvested land, as units of land harvested are reported as "NA".

72. Based on the information provided in table 7 for the activity deforestation, Finland shall cancel 14,516,159 assigned amount units, emission reduction units, certified emission reduction units and/or RMUs in its national registry.

73. Based on the information provided in table 7 for the activity forest management, Finland shall issue 16,973,124 RMUs in its national registry.

Calculation of the commitment period reserve

74. Finland has reported its commitment period reserve in its 2014 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (319,515,790 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT disagrees with this figure. The ERT's calculation of the commitment period reserve is 304,828,656 t CO_2 eq based on 100 per cent of five times the most recent inventory, which is lower than 90 per cent of the assigned amount. In response to a question raised by the ERT during the review, Finland agreed with this figure. The ERT recommends that Finland include the correct information on its commitment period reserve in its annual submission.

3. Changes to the national system

75. Finland reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

76. Finland reported that there are changes in its national registry since the previous annual submission. The Party described the changes in its NIR (page 450), specifically regarding: the name of the registry administrator (from the Energy Market Authority to the Energy Authority); test results and documentation on the structure of the database, both of which were limited and only affecting EU ETS functionality; and the link to publicly available information. The ERT concluded that, taking into account the confirmed changes in the national registry, Finland's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance

with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

77. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Finland provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

78. Finland reported that there are changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the changes in the NIR (page 452); they do not affect the main principles related to the minimization of adverse impacts but rather serve to emphasize how Finland strives to minimize adverse impacts in other countries and the areas prioritized.

79. The actions undertaken by the Party to minimize adverse impacts include the implementation of bilateral and multilateral capacity-building programmes in Zambia, southern Africa and the Mekong region. Regional programmes that promote the role of the private sector in providing energy services are also ongoing in Latin America, sub-Saharan Africa and parts of Asia.

80. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.

III. Conclusions and recommendations

A. Conclusions

81. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Finland, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Finland

Issue	*Expert review team assessment*	*Paragraph cross references for identified problems*
The ERT concludes that the inventory submission of Finland is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	Table 3
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Finland has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	

Issue	*Expert review team assessment*	*Paragraph cross references for identified problems*
Finland's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Generally	48, 50
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Generally	74
Finland has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Finland provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

82. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified.

Table 9
Recommendations identified by the expert review team

Sector	*Category cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross references*
Cross-cutting	Completeness	Estimate and report emissions from all mandatory categories for all years	No	Table 3
Energy	Sector overview	Thoroughly review its QA/QC processes in order to ensure that parts of the text from the previous annual submission are not incorrectly carried over to the current annual submission	No	17
		Review the reporting in the CRF tables with respect to oil venting to ensure that there is no duplication of information on AD and that an explanation is provided in the documentation box to clarify that NMVOC emissions are related to oil venting	No	17
		Include in the NIR all information provided to the ERT during the review with regard to oil venting and flaring	No	17
		Provide additional information in the NIR to prove that consistency of the time series and completeness for 1990 are ensured. If minor emissions, in 1990, cannot be excluded, either estimate those emissions or report the notation key "NE"	No	19
		Make efforts to provide disaggregated AD in the energy sector, to the extent possible, especially for those fuels for which the aggregation would imply the use of very different EFs	Yes	20
	Comparison of the reference approach with the sectoral approach and international data	Continue to explore the reasons for the difference between the sectoral and reference approach, especially for those years where the differences are significant, and provide additional explanation in its NIR in order to increase the transparency	No	22
		Address the errors identified in the early years of the IEA time series	No	23
	International bunker fuels	Provide in the NIR the response provided during the review to explain the difference in total fuel reported in the CRF tables and to the IEA	No	25
	Stationary combustion: liquid and solid fuels – CO_2	Ensure time series consistency for coal used in public electricity and heat production	Yes	27
	Road transportation: liquid fuels –CH_4	Include all relevant information with regard to the calculation of CH_4 emissions, including the results of the improved model and its impact on the CH_4 IEF	No	29

Sector	*Category/ cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross references*
	Stationary combustion: natural gas, biomass and other fuels – CH_4	Include a paragraph about the changes in boiler data and the impact of these changes on the CH_4 IEFs in the NIR and update the text annually	No	30
	Oil and natural gas: liquid and gaseous fuels – CO_2 and CH_4	Include all relevant information provided during the review in the NIR to explain the trends the IEF for oil flaring.	No	31
Agriculture	Sector overview	Enhance QC procedures to ensure that the NIR is updated with the correct data and information for every new annual submission	No	38
	Enteric fermentation – CH_4	Include a description in the NIR of how the EFs for the different swine categories were compiled, complete NIR table 6.2-5 and update appendix 6a of the NIR	No	39
	Manure management–N_2O	Include the reference for the ratio used to divide N between the dung part and urine part of the manure for the calculation of the weighted N_2O EF for solid storage	Yes	40
	Direct soil emissions – N_2O	Improve QC procedures to ensure that the correct information is provided in NIR table 10.4-2	No	41
		Provide information in the NIR on the agricultural production practices in the early 1990s to explain the sudden decrease in total crop yield after 1990 and improve QC procedures to ensure that the correct information is provided in NIR table 10.4-2	Yes	42
	Manure management – CH_4	Improve the justification of the use of the country-specific MCF for deep litter	No	43
LULUCF	Sector overview	Ensure the consistency of the reported data by enhancing the QA/QC procedures	No	46
		Include information in the NIR on the total forest area assessed by the NFI and on the use of ancillary data sources to detect the land-use changes occurring before and after the NFI measurements	No	47
	Grassland remaining grassland – CO_2	Report the carbon stock changes associated with the living biomass pool	Yes	48
	N_2O emissions from disturbance associated with land-use conversion to cropland – N_2O	Accurately report the area of land converted to cropland in CRF table 5(III) and CRF table 5.B, and enhance QA/QC procedures	No	49

Sector	*Category, cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation[a] (Yes or No)*	*Paragraph cross references*
	Biomass burning – CO_2, CH_4, N_2O	Report emissions related to biomass burning in land converted to cropland, grassland remaining grassland (wildfires only), land converted to grassland, and settlements	No	50
Waste	Wastewater handling – N_2O	Include a clear description of the methodology used for the purification of sewage wastewater	No	58
	Other (waste) – CH_4 and N_2O	Enhance the descriptions in the NIR on the AD for composted waste and the destination of industrial waste and sludge from wastewater handling plants	Yes	59
KP-LULUCF	Overview	Ensure the consistency of the reported data by enhancing QA/QC procedures	No	63
	Afforestation and reforestation	Include information on recalculations in the NIR	No	64
	Deforestation	Clarify in the NIR that the decomposition of litter is included in the emissions from stock piles and that the emissions due to decomposition of fine dead roots (litter in peat) are included in the EFs for peat production fields.	No	65
Information on Kyoto Protocol reserve unites	Commitment period	Include the correct information on its commitment period reserve in the annual submission	No	74

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT= expert review team, IEA = International Energy Agency, IEF = implied emission factor, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry MCF = methane conversion factor, N = nitrogen, NE = not estimated, NFI = national forest inventory, NIR = national inventory report, NMVOC = non-methane volatile organic compounds, QA/QC = quality assurance/quality control.

IV. Questions of implementation

83. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	319 515 790	304 828 656		304 828 656
Annex A emissions for 2012				
CO_2	50 733 333			50 733 333
CH_4	4 083 291			4 083 291
N_2O	5 184 831			5 184 831
HFCs	925 534			925 534
PFCs	1 891			1 891
SF_6	36 851			36 851
Total Annex A sources[c]	**60 965 731**			**60 965 731**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–134 972			–134 972
3.3 Afforestation and reforestation on harvested land for 2012	NA			NA
3.3 Deforestation for 2012	2 486 440			2 486 440
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–35 598 200			–35 598 200
3.4 Cropland management for 2012				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	56 403 343			56 403 343
CH_4	4 122 491			4 122 491
N_2O	5 266 307			5 266 307
HFCs	1 031 775			1 031 775
PFCs	1 376			1 376
SF_6	35 821			35 821
Total Annex A sources[c]	**66 861 113**			**66 861 113**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–111 961			–111 961
3.3 Afforestation and reforestation on harvested land for 2011	NA			NA
3.3 Deforestation for 2011	2 727 095			2 727 095
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–33 576 834			–33 576 834
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	63 488 303			63 488 303
CH_4	4 265 293			4 265 293
N_2O	5 438 403			5 438 403
HFCs	1 169 574			1 169 574
PFCs	750			750
SF_6	35 068			35 068
Total Annex A sources[c]	**74 397 391**			**74 397 391**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–93 705			–93 705
3.3 Afforestation and reforestation on harvested land for 2010	NA			NA
3.3 Deforestation for 2010	2 832 376			2 832 376
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–33 235 025			–33 235 025
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	55 066 730			55 066 730
CH_4	4 208 869			4 208 869
N_2O	5 779 469			5 779 469
HFCs	888 831			888 831
PFCs	9 317			9 317
SF_6	49 820			49 820
Total Annex A sources[c]	**66 003 036**			**66 003 036**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–73 754			–73 754
3.3 Afforestation and reforestation on harvested land for 2009	NA			NA
3.3 Deforestation for 2009	3 057 298			3 057 298
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–48 883 603			–48 883 603
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	57 993 050			57 993 050
CH_4	4 275 351			4 275 351
N_2O	6 802 280			6 802 280
HFCs	993 190			993 190
PFCs	11 231			11 231
SF_6	51 158			51 158
Total Annex A sources[c]	**70 126 260**			**70 126 260**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–61 976			–61 976
3.3 Afforestation and reforestation on harvested land for 2008	NA			NA
3.3 Deforestation for 2008	3 412 950			3 412 950
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–37 957 685			–37 957 685
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Finland 2014. Available at <http://unfccc.int/resource/docs/2014/asr/fin.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/FIN. Report of the individual review of the annual submission of Finland submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/fin.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms Riitta Pipatti (Statistics Finland), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Finland:

Korhonen, J. F. J., M. Pihlatie, J. Pumpanen, H. Aaltonen, P. Hari, J. Levula, A.-J. Kieloaho, E. Nikinmaa, T. Vesala, and H. Ilvesniemi (2013). *Nitrogen Balance of a Boreal Scots Pine Forest*. Biogeosciences, 10, 1083–1095. Available at www.biogeosciences.net/10/1083/2013/.

Pihlatie, M., J. Pumpanen, J. Rinne, H. Ilvesniemi, A. Simojoki, P. Hari and T. Vesala. (2007). *Gas Concentration Driven Fluxes of Nitrous Oxide and Carbon Dioxide in Boreal Forest Soil*. Tellus 59B, 458–469. Blackwell Munksgaard.

Pilegaard, K., U. Skiba, P. Ambus, C. Beier, N. Br¨uggemann, K. Butterbach-Bahl, J. Dick, J. Dorsey,

J. Duyzer, M. Gallagher, R. Gasche, L. Horvath, B. Kitzler, A. Leip, M. K. Pihlatie, P. Rosenkranz,

G. Seufert, T. Vesala, H. Westrate, and S. Zechmeister-Boltenstern. (2006). Factors controlling regional differences in forest soil emission of nitrogen oxides (NO and N_2O). Biogeosciences, 3, 651–661. Copernicus GmbH on behalf of the European Geosciences Union. Available at www.biogeosciences.net/3/651/2006/.

Schindlbacher, A., S. Zechmeister-Boltenstern, and K. Butterbach-Bahl (2004). Effects of soil moisture and temperature on NO, NO2, and N_2O emissions from European forest soils, J. Geophys. Res., 109, D17302, doi:10.1029/2004JD004590.

B. Tupek1, K. Minkkinen1, J. Pumpanen1, T. Vesala2, and E. Nikinmaa (2014). *CH_4 and N_2O Dynamics in the Boreal Forest–mire Ecotone*. Biogeosciences Discuss, 11, 8049–8084. Copernicus Publications on behalf of the European Geosciences Union. Available at www.biogeosciences-discuss.net/11/8049/2014/

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
C	confidential
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union emissions trading system
FOD	first-order decay
$Frac_{NCRBF}$	fraction of crop biomass that is nitrogen
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MSW	municipal solid waste
N_2O	nitrous oxide
N	nitrogen
NA	not applicable
NE	not estimated
NFI	National Forest Inventory
NIR	national inventory report
NMVOC	non-methane volatile organic compound
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
t	tonne

TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change